

Applicant: Vilho Nissinen et al.
Application No.: 10/529,516
Response to Office action mailed Mar. 3
Response filed May 19, 2009

Claim Listing

1-10. (cancelled)

11. (currently amended) An array of nozzles for use in coating by high-pressure spraying techniques a web of material moving in a first direction, the array of nozzles comprising:

at least one row of a plurality of secondary spray nozzles oriented transverse to the first direction;

wherein each secondary spray nozzle has portions defining ~~is comprised of~~ a tapered duct, tapering to ending in a closed tip in which a V-shaped groove has been machined, the V-shaped groove defining a secondary nozzle orifice defining a transverse nozzle orifice area, the nozzle orifice arranged to form a jet of coating material; and

wherein the V-shaped groove has a first side and a second side which intersect to define an angle which is between 25 to 50 degrees;

wherein each secondary spray nozzle is connected to a preliminary nozzle, and

wherein the preliminary nozzle starts from a preliminary nozzle orifice which leads into an expanding duct, the expanding duct being connected to the tapered duct of the secondary spray nozzle so that a flow into the preliminary nozzle orifice leads into the expanding duct of the preliminary nozzle and then into the tapered duct of the secondary spray nozzle and then to the secondary nozzle orifice.

12. (previously presented) The array of nozzles of claim 11, in which the angle is between 35 to 45 degrees.

13. (currently amended) The array of nozzles of claim 11, wherein each secondary transverse nozzle orifice area is oval in shape.

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14. (currently amended) The array of nozzles of claim 11, wherein the secondary nozzle orifice defines a maximum diameter and a minimum diameter and a ratio between said maximum diameter and said minimum diameter which is greater than 1.2.

15. (previously presented) The array of nozzles of claim 14, wherein the ratio is between 1.2 and 3.

16. (previously presented) The array of nozzles of claim 15, wherein the ratio is between 1.5 and 2.5.

17. (currently amended) The array of nozzles of claim 11, wherein the secondary nozzle orifice has dimensions of between 1.0–0.3 mm by between 0.5–0.1 mm.

18. (currently amended) The array of nozzles of claim 17, wherein the secondary nozzle orifice has dimensions of between 0.75–0.4 mm by between 0.35–0.15 mm.

19. (canceled)

20. (canceled)

21. (currently amended) The array of nozzles of claim [[19]] 11, wherein each preliminary nozzle ~~flow~~ orifice defines ~~an~~ flow orifice area which is at the most 1.1 times the secondary transverse nozzle area of the nozzle orifice to which the preliminary orifice is of the connected secondary nozzle.

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22. (currently amended) The array of nozzles of claim 21, wherein the ~~flow orifice~~ area of the preliminary nozzle orifice is at most equal to the secondary transverse nozzle orifice area of the ~~nozzle orifice of the connected secondary nozzle~~.

23. (currently amended) The array of nozzles of claim ~~[[19]]~~ 11, wherein the ~~flow orifice of the~~ preliminary nozzle orifice has a diameter of between 0.1 mm and 1 mm.

24. (currently amended) The array of nozzles of claim 23, wherein the diameter of the ~~flow orifice of the~~ preliminary nozzle orifice is between 0.25 and 0.55 mm.

25. (currently amended) The array of nozzles of claim ~~[[19]]~~ 11, wherein the ~~area of the flow orifice or the~~ preliminary nozzle orifice has an area which is equal to or less than 50 percent of the secondary transverse nozzle orifice area of the ~~nozzle orifice of the connected secondary nozzle~~.

26. (currently amended) The array of nozzles of claim 25, wherein the ~~area of the flow orifice of each~~ preliminary nozzle orifice has an area which is equal to or less than 20 percent of the secondary transverse nozzle orifice area of the ~~nozzle orifice of the connected secondary nozzle~~.

27. (previously presented) The array of nozzles of claim 11 wherein the web of material is a paper web.

28– 32. (canceled)

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33. (currently amended) An array of nozzles with reduced wear characteristics for use in coating by high-pressure spraying techniques a moving web of paper or cardboard mounted for motion in a first direction, the array of nozzles comprising:

at least one row of a plurality of secondary spray nozzles which are arrayed transverse to the first direction;

wherein each secondary spray nozzle has portions defining a tapered duct which ~~tapers to ends with~~ a tip which is closed but for portions of the nozzle forming a transverse V-shaped groove which intersects the tip, thereby defining a secondary nozzle orifice ~~which defines~~ defining a transverse nozzle orifice area, the secondary nozzle orifice arranged to form a jet of coating material; and

wherein the V-shaped groove has a first side and a second side which intersect to define an angle which is between 25 to 50 degrees;[[,]]

wherein each secondary spray nozzle is connected to a preliminary nozzle, so that the tapered duct ~~ending with a tip of the secondary spray nozzle~~ is in flow receiving relation to portions of the preliminary nozzle forming an expanding duct which starts from and in turn is in flow receiving relation to portions of the preliminary nozzle forming a flow orifice, the flow orifice defining an area, the flow orifice in flow receiving relation to a supply of coating at a pressure between 1 MPa and 200 Mpa.

34. (currently amended) The array of nozzles of claim 33, wherein the secondary nozzle orifice defines a maximum diameter and a minimum diameter and a ratio between said maximum diameter and said minimum diameter which is greater than 1.2.

35. (currently amended) The array of nozzles of claim 33 wherein the preliminary nozzle flow orifice area is at the most 1.1 times the transverse area of the secondary nozzle orifice of the connected secondary spray nozzle.

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36. (previously presented) The array of nozzles of claim 33 wherein the flow orifice of the preliminary nozzle has a diameter of between 0.1 mm and 1 mm.

37. (currently amended) The array of nozzles of claim 33 wherein the area of the flow orifice of the preliminary nozzle is equal to or less than 50 percent of the transverse area of the secondary nozzle orifice of the connected secondary nozzle.

38. (canceled)